

NASA's Solar System Exploration Program

R. Stephen Saunders

As NASA's Solar System Exploration program enters its fifth decade, it continues to provide new discoveries, new excitement, and new insight into the origins, evolution, and destiny of our solar system, our planet, and life itself. With seven missions presently active, and another dozen scheduled for launch in the next five years, this unprecedented level of exploration and discovery promises to continue and even increase.

The overarching scientific goals for the Exploration of the Solar System are expressed as three Quests. The Quests form an engaging and compelling framework for the development of detailed scientific objectives, measurement priorities, and flight missions. The missions of Solar System Exploration are conducted within several programs, each of which has an annual budget that covers mission development, launch, and operations. The three existing programs are the Outer Planets program, the Mars Surveyor program, and the Discovery program.

Exploration of the outer planets, from the early Pioneer and Voyager flybys to today's Galileo mission, has revolutionized our view of the solar system. In part, we have learned that the outer planets and their moons are rich in organic material, that subsurface liquid water may exist in some places, and that prebiotic chemical processes are taking place in some of these environments. The Cassini/Huygens mission, en route to Saturn, will extend this exploration by conducting an intensive study of Titan's atmosphere and surface.

The present Outer Planets Program focuses on environments in the outer solar system that can provide insight into prebiotic chemistry and the building blocks of life. The first two missions in this program, Europa Orbiter and Pluto/Kuiper Express are currently under development for launch in 2003 and 2004 respectively. Following those, the highest priority missions are the Europa Lander, Titan Explorer, and Neptune Orbiter. These will build on the results from the past, present, and upcoming missions and will conduct in-depth analyses of these organic-rich environments. Mission sequence decisions will be based on continuing scientific discoveries and the progress of technology developments.

Mars Surveyor is a program of systematic exploration and discovery that represents the nation's long-term commitment to exploring the planet Mars. The overarching scientific goals are to develop an understanding of the biological history and potential of Mars and to search for evidence of past or present life. The history of water and the Martian climate are key elements in this search and are thus critical near-term objectives. Over time, the program will establish Mars robotic outposts and a Mars-Earth communications infrastructure that will link the two planets as the first nodes in a "solar system internet". In the longer term, the program will help us to understand the potential for utilization of Martian resources and will lay the groundwork for future human exploration.

Discovery is a highly successful program of community-defined, competitively selected missions. Four missions have been launched so far – NEAR, Mars Pathfinder, Lunar Prospector, and Stardust - and four more are currently under development. A wide variety of solar system targets will be addressed within the Discovery program. Innovations within the program include “Missions of Opportunity” and Discovery Micromissions.

Missions to return samples of a comet nucleus and of Venus’ surface will be key elements of the future program, and will expand our knowledge of the formation and evolution of planetary environments.